IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of:		§	Group Art. Unit: 2128
	Omer M. Gurpinar, et al	§	Examiner: Frejd, Russell
Serial No.:	09/659,951	§	Atty. Docket: **94.0034**
Filed:	September 12, 2000	§	
For:	INTEGRATED RESERVOIR OPTIMIZATION	§	

INFORMATION DISCLOSURE STATEMENT

Mail Stop - RCE
Commissioner for Patents
P.O. Box 1450
Washington, D.C. 22313-1450

Dear Sir:

This Information Disclosure Statement is being submitted with an RCE for continued prosecution. Please consider the enclosed references and make them of record in the captioned application. This disclosure statement does not imply the submitted information is prior art or material to patentability.

The enclosed references were cited in a European Patent Office search of a related application. A copy of the International Search Report is enclosed.

The references and the relevance category each were given are shown below. Applicants' comments concerning each are also given.

1. U.S. Patent 5,881,811 to Lessi, et al ("**Lessi**"): Category A

   Lessi discloses "a method for modeling the effects of interactions between wells on the watercuts in effluents produced by one or more wells through a zone of underground hydrocarbon reservoir under development, swept by a fluid under pressure injected though one of more injection wells or swept by water form an aquiferous zone, in order to optimize reservoir production."

(**Lessi** Abstract.)

> "The method comprises:
> selecting a set of significant data from the raw data taken from records relative to the injection of sweep fluids in the reservoir and from records relative to the production of effluents by one or more production wells, and
> setting up, by iterations, an optimized linear model connecting the variations with time of the significant data relative to the watercut in the production of the producing well with the variations of time of the significant data relative to the other wells of the series of wells."

(**Lessi**, Col. 2, lines 25-35.)

> "When the interaction factors affecting the production of water being brought our by the model [are] thus achieved, reservoir engineers are in a position to influence various parameters: selection of the injection wells, injection rates, production rates, etc., in order to increase the sweep efficiency and the oil recovery rate."

(**Lessi**, Col. 2, lines 36-41).

2. International Publication No. WO 98/37465 (PCT Application No. PCT/US98/03356) to Baker Hughes with inventors Hales et al ("**Hales**"): Category A.

> Hales discloses "adaptive optimization software systems which comprise intelligent software objects (hereinafter sometimes "ISO" or "ISOs") arranged in a hierarchical relationship whereby the goal seeking behavior of each ISO can be modified by ISOs higher in the ISO's hierarchical structure." (**Hales**, page 1 of the application, lines 7-11.) Such ISO include "expert system objects, adaptive models objects, optimizer objects, predictor objects, sensor objects, and communication/translation objects." (**Hales**, page 1 of the application, lines 12-14.) **Hales** discloses "a method of human interaction with said adaptive optimization software." (**Hales**, page 1 of the application, lines 15-16.) "Each ISO 10 is configured with sensor objects 25 … acting as data managers of the state(s) of the controlled process, including the state(s) of the controlled variables for the process. Using these sensor objects 25, ISO's 10 expert system objects 12, predictor objects 18, adaptive models objects 20, and optimizer objects 22 work together to find, calculate, interpret, and derive new states for the control variables that result in desired process state(s) or achieve the process goal(s)."

(**Hales**, page 9 of the application, lines 15-22.)

"In addition to real-world process, concrete components, and/or abstract components, the instant [Hales] invention's adaptive optimization software system is designed to monitor its own performance and adaptively modify its own initial configuration to improve performance according to it initial optimizing objectives, its current optimizing objectives and objectives specified by system users." (**Hales**, page 9 of the application, lines 23-28.)

3. European Patent Application EP 0 881 357 A2 to Halliburton Energy Services, with inventor Stephenson ("**Stephenson**"): Category X (Y if taken with XP000957690)

> **Stephenson** discloses a method managing the development of an oil or gas reservoir using "a neural network technology so that multiple input parameters can be used for determining a meaningful correlation with a desired output, but the present [Stephenson] invention further automates this process to overcome the deficiencies in the prior expert, trial-and-error neural network technique. In particular, the present [Stephenson] invention uses genetic algorithms to define the neural network topology and corresponding optimal inputs."

(**Stephenson** at page 2, lines 33-37.)

Stephenson discloses the steps of:

(a) selecting an oil or gas reservoir, wherein the reservoir has a plurality of wells drilled therein from which oil or gas has been produced;

(b) identifying well drilling parameters associated with drilling of the plurality of wells;

(c) identifying well completion parameters associated with completing the plurality of wells;

(d) identifying well stimulation parameters associated with stimulating the plurality of wells;

(e) identifying formation parameters associated with the locations in the reservoir where the plurality of wells are drilled;

(f) identifying production parameters associated with the production of oil or gas from the plurality of wells;

(g) selecting at lease one drilling parameter, at least one completion parameter, at least one stimulation parameter, at least one formation parameter, and at least one production parameter from among the identified well drilling parameters, well completion parameters, well stimulation parameters, formation parameters and production parameters;

(h) converting the selected parameters to encoded digital signals for a computer;

(i) defining within the computer a neural network topology representing a relationship between the selected drilling, completion, stimulation, and formation parameters and the at lest one selected production parameter in response to the encoded digital signals, including manipulating the encoded digital signals in the computer using genetic algorithms to define the neural network topology;

(j) entering into the computer as inputs to the defined neural network topology a first group of additional encoded digital signals representing proposed drilling, completion, stimulation, and formation parameters of the same type as the selected drilling, completion, stimulation, and formation parameters and generating an output from the defined neural network topology in response;

(k) repeating step (j) using at least a second group of additional encoded digital signals representing other proposed drilling, completion, stimulation, and formation parameters; and

(l) controlling further development of the oil and gas reservoir in response to at least one of the generated outputs, including at least one step selected from the group consisting of (1) drilling at least one new well in the reservoir in response to the generated output and (2) treating at least one well in the reservoir in response to the generated output.

(**Stephenson** at page 2, line 50 through page 3, line 18.)

Although **Stephenson** discloses a kind of reservoir modeling using a neural network, this is not a "reservoir characterization," as recited in the instant claims. "Reservoir characterization" is a term of art and involves creating a physical representation of the geology of a reservoir using physics. Reservoir characterizations actually model the physical parameters of the reservoir so that a flow simulator can predict production and so that problems may be identified and addressed with remedial action. The neural network model is more like a black box: it is a non-linear transformation of one set of data (drilling, completion, stimulation, and formation parameters) into another (production parameters). The "topology" mentioned by **Stephenson** is not the physical topology of the geology of the reservoir but rather a mathematical map of the artificial neurons and connections that make neural network function. Unlike use of a reservoir characterization, use of neural network models cannot explain the results of the system or identify its problems.

Stephenson does not appear to provide any teaching of using "low rate monitor data" and "high rate monitor data" which are "assimilated together" to determine when it is necessary to update an initial reservoir development plan, as recited in Claim 1, for example, of the present application.

4. Reference No. XP-000957690 ("Projects Implement Management Plans" by L. E. Safley and M.L. Fowler (**Projects**): Category Y

> The Projects reference describes a "reservoir management plan that takes into consideration:"
>
> - The reservoir system;
> - Proven and still-evolving technologies; and
> - The business environment under which the reservoir management plan will be implemented.

Projects at page 137, third column. See also Figure 1.

> **Projects** lists the "primary steps" as:
>
> - Defining the target size;
> - Locating the target;
> - Identifying appropriate technologies;
> - Optimizing technology implementation; and
> - Optimizing operational procedures and technologies.

Projects at page 139, near top of first column.

Projects goes on to describe application of this plan in three different case studies.

5. Reference No. XP-000957748 ("The Road Ahead to Real-Time Oil and Gas Reservoir Management" by R.G. Smith and G.C. Maitland) ("**Road**"): Category X (Y if taken with XP000957690)

While page numbers cited herein refer to the somewhat blurred copy received from the EPO, Applicants also provide for the Examiner's convenience a more easily read version obtained directly from one of the authors and indicate page and paragraph numbers for this "Second version", as well.

For this paper, the "topic is the science and engineering of hydrocarbon recovery processes and, while providing a summary of existing practices, the main aim is to provide a vision of how these practices might evolve over the next decade or so." (**Road** at page 539, col.1, first paragraph; Second version, page 2, first paragraph.)
For many years, the dream of the oil company operators has been to integrate the data, interpretations, models, simulations, and effects of development and production decisions in such a way as to optimally deplete the reservoir according to a business model and

economic constraints. The basic steps are shown in Figure 1." (**Road** at page 540, col.2, fourth (full) paragraph; Second version, page 4, first full paragraph.)

For many of the boxes of Figure 1, **Road** goes on to describe existing technology and what the authors think might be achieved in the next ten years (i.e. up to 2008).

> In what follows, we touch on many of the boxes shown in the Figure, including the extremely important field "Implementations" – taking action based on the data, modeling, and simulation. Given this is the reservoir management process of today, <u>what technology advances could result in substantial improvement</u>? We discuss this under four headings, key technology highways on our route to doubling recovery:
>
> - Reservoir Modeling
> - Well Construction
> - Well productivity optimization
> - Reservoir management

(**Road** at page 541, left hand column, lines 20-32, below the figures; Second version page 4, last paragraph to top of page 5) (Emphasis added.).

For example, in Figure 2, the reservoir model of "today" (1997), the "Coarse Reservoir model" is depicted on the left side of the figure, while the long term goal of a Shared Earth Model is depicted on the right side of the figure (as one faces it). The limitations of the Coarse Earth model as discussed in the section entitled "Existing Technology – Coarse Reservoir Model" beginning in the second column of page 541 (Second version, near bottom of page 5). Near term improvements are discussed in the section entitled "Near Term" beginning in the first column of page 542 (Second version, top of page 7) and long term improvements are discussed in the section entitled "Long Term – Integrated Reservoir Model" beginning in the first column of page 543 (Second version, top of page 9).

Respectfully Submitted,

Danita J.M. Maseles
Registration No. 33,419

Date: June 6, 2005

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Enclosures:

1. Form PTO/SB/08A (2 pages)
2. 2.Form PTO/SB/30 (1 page & duplicate)
3. 3,Copy of Reference US Patent No. 5,881,811 (14 pages)
4. 4.Copy of Reference International Publication No. WO 98/37465 (82 pages)
5. Copy of Reference European Patent Application EP 0 881 357 A2 (17 pages)
6. Copy of Reference Article XP-000957690 "Projects Implement Management Plans" (6 pages)
7. Copy of Reference Article XP000957748 entitled "The Road Ahead to Real-Time Oil and Gas Reservoir Management" (18 pages & 31 pages)
8. Copy of Supplementary Partial European Search Report (4 pages)
9. Copy of European Opinion (5 pages)

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	09/659,951
Filing Date	09/12/2000
First Named Inventor	Omer M. GURPINAR
Art Unit	2128
Examiner Name	Russell Warren FREJD
Attorney Docket Number	94.0034

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 5,881,811	03-16-1999	Jaques Lessi, et al.	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		WO/98/37465 A	08-27-1998	Baker Hughes In		
		EP 0 81357 A	12-02-1998	Halliburton Ene		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1]Applicant's unique citation designation number (optional). [2]See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

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(Use as many sheets as necessary)

Sheet	2	of	2

Complete if Known	
Application Number	09/659,951
Filing Date	09/12/2000
First Named Inventor	Omer M. Gurpinar
Art Unit	2128
Examiner Name	Russell Warren FREJD
Attorney Docket Number	94.0034

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		SMITH R G ET AL "The Road Ahead to Real-Time Oil and Gas Reservoir Management" Chemical Engineering Research and Design Part A, July 1998 XP000957748	
		SAFELY L E ET AL "Projects Implement Management Plans" American Oil and Gas Reporter, Domestic Petroleum Publishers, Wichita KS vol. 41, no 9 September 1998 XP000957690	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.